

leakage of internally generated signals, and that to a much looser tolerance. It is essential that equipment that may be directly connected to a cable system meet the same shielding standards as other cable equipment, when fed the maximum expected input signal level of + 20 dBmV. Even though no longer required to do so by Commission rules, converter manufacturers universally produce product which meets this standard.

- Re-radiation of Cable Signals from Customer's Antennas.

*Antenna selector switches, when provided on devices, shall provide at least 80 dB of isolation between the input ports between the frequencies of 54 and 216 MHz and 60 dB of isolation between 216 MHz and 1000 MHz.*

In 1987, the Commission considered the problem of specifying adequate isolation in antenna selector switches to prevent harmful re-radiation of cable signals from antennas.

It concluded that 80 dB of isolation was needed below 216 MHz and 60 dB between there

adequate tuning range and a UHF noise figure that assures picture quality in low-signal situations. Now they are asked to also assure that it will work when connected to a cable system. This does not require specifying an ultimate-quality system, but does require specifying the minimum level of performance that assures reasonable performance in that environment, which differs in some critical ways from over-air reception:<sup>17</sup>

- Input signals can vary from 0 dBmV to about +20 dBmV.
- The level variation across the spectrum can be as high as 13 dB in a 550 MHz system and even more in 750 or 1000 MHz systems.
- The spectrum includes adjacent channels whose levels can vary by up to 3 dB and whose aural subcarriers can vary from 10 to 17 dB below associated visual carriers.
- The channel boundaries can follow one of three schemes (standard, IRC or HRC).
- The aural intercarrier frequency tolerance is  $\pm 5$  kHz.

In addition to the regulations now in effect protecting over-air reception quality and those governing A-B switch isolation, the following minimum standards are suggested:

- Signal Loss in Cascaded Equipment.

*For devices which, in one or more operating modes, pass a portion of the input signal through to an output port for connection to a second device, the signal loss shall not be in excess of 5 dB for any frequency between 54 MHz and the maximum tuning frequency of the device.*

Cable operators are required to deliver a minimum level of 0 dBmV to the first piece of consumer equipment. If that first piece of equipment is a VCR, it typically contains an internal signal splitter with one leg feeding its internal tuner and the other feeding a bypass switch to deliver signal to the TV when the unit is turned off. The total loss of that configuration is important in assuring that the following television set can achieve a reasonably noise-free picture. Allowing for the loss of the splitter and a reasonable allowance for the switch, the total loss should be specified to be no greater than 5 dB.

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<sup>17</sup>FCC Rules §76.605(a).

- Shielding from DPU.

***When the device is subject to an external field of 1 volt per meter at any frequency between 54 and 1000 MHz, the level of the external signal appearing at the input to the detector shall be at least 55 dB below the level of a signal at the same frequency applied to the input terminal with a level of 0 dBmV.***

As discussed above, in addition to potential interference to neighboring television reception, DPU frequently affects the subscriber with the inadequately shielded television set. Currently, a cable operator's only solution is to provide adequately shielded converters whose output is on a locally unused television channel. This solves the problem, but frustrates the subscriber and the intent of the Cable Act in assuring consumer-friendly delivery mechanisms.

Clearly, as discussed above, the Commission needs to define a field strength below which customers should have an expectation that a cable-ready device will not have noticeable DPU interference. As discussed above, all major converter manufacturers routinely build products that work in very high field environments without direct pickup problems.

- A-B Switch DPU Isolation.

***Antenna selector switches, when provided on devices, shall provide at least 80 dB of isolation between the non-selected input and the common port for frequencies of 54 and 800 MHz and 60 dB of isolation between 800 and 1000 MHz. For receivers whose tuning range is less than 1000 MHz, the specification only applies up to the maximum tuning range of the device.***

Just as television set internal wiring can pick up unwanted interfering signals, so inadequate isolation in input selector switches can lead to DPU problems. Given that antenna input signals can easily exceed +25 dBmV and cable signals can be as low as 0 dBmV, a switch isolation of 80 dB is required to prevent serious interference in most cases (55 dB desired/undesired signal ratio). The problem is especially critical in the UHF broadcast band (which will become very heavily populated under the proposed HDTV simulcasting proposals), because the channels are offset by 2 MHz from standard and IRC channels and 2.75 MHz from HRC channels. To prevent a problem with UHF DPU interference, the isolation between the non-selected switch port and the common port (tuner) needs to remain at 80 dB through 800 MHz, or the maximum tuning range of the receiver, whichever is less.

- Image Rejection.

*The response of the device to any signal differing in frequency from the selected channel by twice the frequency of the first intermediate frequency (IF) amplifier shall be at least 63 dB lower than its response to the selected channel, provided that the undesired signal*

procedure needs to be specified to assure a "barely perceptible" level of interference in that environment.

- Internal Distortion Products.

*Distortion products generated within devices and measured at the input to*

## *Characteristics Which Enable Consumer-Friendly Signal Delivery*

*All devices shall be equipped with an interface connector conforming with the requirements of American National Standards Institute/Electronics Industry Association (ANSI/EIA) specification 563.*

A major thrust of the Cable Act is the desired solution to the awkward interface that results when a standard cable converter is connected to a household which may include a VCR and/or a television set with advanced features such as remote control, picture-in-picture, etc. While the section of available technologies above discusses many alternatives to solving this dilemma, it is obvious that the most cost-effective solution is the use of the ANSI/EIA 563 Decoder Interface Connector on reception equipment, combined with low-cost descramblers.

With this solution, not only are the immediate interface problems solved, but an smooth path to HDTV and digitally compressed channels is created with will allow seamless upgrades to those technologies without re-creating the converter problem.

Although the cost of the Connector is reasonable, there has been a reluctance on manufacturers' parts to include the feature because, until there is a high probability of available decoders for use with it, it cannot be promoted to potential purchasers and, therefore, there is no sales advantage. From the cable operator's standpoint, although there are a few TV sets in consumer's hands with the jack, there is no ready way to identify them. Finally, converter manufacturers are reluctant to produce the low cost decoders for the very limited current market.

Under the auspices of the Cable Act, the Commission has the opportunity to effect the most cost-effective and consumer-friendly solution to the consumer interface requirements by simply mandating inclusion of the jack on all cable-ready devices.<sup>20</sup> In addition to TVs and VCRs, that should include converters, since they are used to convert non-cable-ready TVs into cable ready TVs. Without inclusion of the jack, the converter would become useless if the subscriber were to desire a scrambled premium service.

## **SUMMARY OF CONSUMER RECEIVER ISSUES**

1. Device regulation should cover all devices (TVs, VCRs and converters) which have a tuning range which includes channels used by cable systems which are not used for over-the-air broadcasting, regardless of the adjectives used to describe them. This approach is consistent with the Commission's previous regulation of television receivers with respect to UHF reception.

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<sup>20</sup>There is certainly precedent for mandated feature inclusion where it is determined that a public goal is met, for instance the requirements on UHF tuners and closed captioning decoders. In this case, a greater percentage of viewers will benefit for a lower per unit cost than was the case with captioning decoders.

2. All extended-range tuning devices should be **required** to meet the specifications discussed herein as desirable for equipment which may be connected to a cable television system.
3. All consumer devices manufactured after the effective date of the new rules which do not meet the extended-range tuning specifications should display the following notice on a removable sticker affixed prominently to the screen (in the case of a TV) or to the front panel (in the case of a VCR):

**Notice: This device does not meet the requirements established by the Federal Communications Commission for equipment designed to work properly when attached to a cable television system.**

This sticker should be required to remain on the consumer equipment until it is removed by the consumer-purchaser after the sale.

## VII. CONCLUSION

The FCC has an historic opportunity to resolve, in one rulemaking, most of the interface problems between cable television systems and consumer television receiving equipment. Reasonable cost performance and feature provisions on consumer equipment designed for connection to cable systems will not only assure present compatibility, but an easy transition to high definition television and digitally compressed television signals. As the Commission analyzes the data provided in this first phase of the proceeding, it should remain mindful of the need to attack the compatibility problem at the point of program use by regulating the way cable services are delivered and the way consumer terminal equipment is designed.

Respectfully submitted,

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